SOLUTIONS

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SOLUTIONS: LINES AND ANGLES

Section A: Multiple Choice Questions

1. **Answer: (c) Equal**
   When two lines intersect, the angles opposite to each other at the vertex are vertically opposite and always equal.

2. **Answer: (c) Reflex angle**
   By definition, a reflex angle is any angle that measures more than $180°$ but less than $360°$.

3. **Answer: (b) $180°$**
   According to the Linear Pair Axiom, if a ray stands on a line, the sum of the resulting adjacent angles is $180°$.

4. **Answer: (c) Supplementary**
   Interior angles on the same side of a transversal (co-interior angles) sum to $180°$ when the lines are parallel.

5. **Answer: (a) $55°$**
   Complementary angles sum to $90°$. Therefore, $90° - 35° = 55°$.

Section B: Short Answer Questions

6. Let the angle be x. Its supplement is $(180° - x)$.
   Given: $x = 4(180° - x) \implies x = 720° - 4x \implies 5x = 720° \implies x = 144°$.

7. Given $AB \parallel CD$:
   1. $x = \angle APQ$ (Alternate Interior Angles) $\implies$ **x = 50°**.
   2. $\angle APR = \angle PRD$ (Alternate Interior Angles) $\implies 50° + y = 127° \implies$ **y = 77°**.

8. Let the angles be $2k, 3k$, and $4k$.
   Sum of angles in a triangle $= 180° \implies 2k + 3k + 4k = 180° \implies 9k = 180° \implies k = 20°$.
   The angles are: $2(20°) = $ **40°**, $3(20°) = $ **60°**, and $4(20°) = $ **80°**.

9. **Linear Pair Axiom:** If a ray stands on a line, then the sum of two adjacent angles so formed is $180°$.
   Can two acute angles form a linear pair? No. An acute angle is $< 90°$. The sum of two acute angles will always be $< 180°$, so they cannot form a linear pair.

Section C: Long Answer Questions

10. **Theorem Proof:**

    Let $AB \parallel CD$ and transversal l intersect them at P and Q.
    We need to prove $\angle 1 = \angle 2$ (Alternate Interior Angles).
    $\angle 1 = \angle 3$ (Vertically Opposite Angles).
    $\angle 3 = \angle 2$ (Corresponding Angles for $AB \parallel CD$).
    From both equations, $\angle 1 = \angle 2$. Hence proved.

11. **Proof:**

Since $OR \perp PQ$, $\angle ROQ = 90°$ and $\angle ROP = 90°$.
$\angle QOS = \angle ROQ + \angle ROS = 90° + \angle ROS \quad \dots(1)$
$\angle POS = \angle ROP - \angle ROS = 90° - \angle ROS \quad \dots(2)$
Subtracting (2) from (1):
$\angle QOS - \angle POS = (90° + \angle ROS) - (90° - \angle ROS) = 2\angle ROS$.
Therefore, $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$.

12. **Proof:**
Let transversal AD intersect lines AB and CD. Let EP and FQ be parallel bisectors of corresponding angles $\angle AEB$ and $\angle EFC$.
Since $EP \parallel FQ$ and AD is a transversal, $\angle AEP = \angle EFQ$ (Corresponding angles).
Since EP and FQ are bisectors, $\angle AEB = 2\angle AEP$ and $\angle EFC = 2\angle EFQ$.
Thus, $\angle AEB = \angle EFC$. Since corresponding angles are equal, $AB \parallel CD$.

13. **Proof:**

In $\triangle ABC$, $\angle ABC + \angle ACB + \angle BAC = 180°$.
Ext. $\angle CBE = 180° - \angle ABC$ and Ext. $\angle BCD = 180° - \angle ACB$.
In $\triangle BOC$: $\angle BOC = 180° - (\frac{1}{2}\angle CBE + \frac{1}{2}\angle BCD)$.
$\angle BOC = 180° - \frac{1}{2}(180° - \angle ABC + 180° - \angle ACB)$.
$\angle BOC = 180° - \frac{1}{2}(360° - (\angle ABC + \angle ACB))$.
$\angle BOC = 180° - 180° + \frac{1}{2}(180° - \angle BAC) = 90° - \frac{1}{2}\angle BAC$.

Section D: Objective Checklist

1. If three or more points lie on the same line, they are called **collinear** points.

2. The sum of all angles around a point is $360°$.

3. If $\angle A$ and $\angle B$ are supplementary and $\angle A = 70°$, then $\angle B = \mathbf{110°}$.

4. A line which intersects two or more lines at distinct points is called a **transversal**.

*** End of Solutions ***